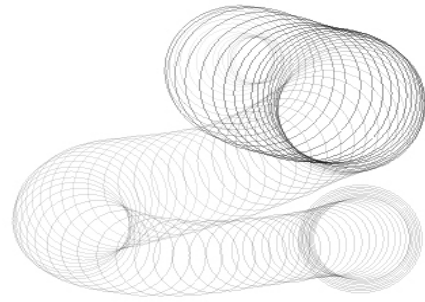


# X-MOTION

## USER MANUAL



### X-MOTION DEFINITION

X-Motion is a system to be used during artistic performances, enabling the creation of graphics based on the performer's body movement. These graphics are projected on the background of the performance, functioning as a stage setting or simply as a visual representation of the movements.

The system works thanks to the motion capturing technology, which brings to computer informations of the performer's trajectory in space. For X-Motion, this capture follows specific points on the artist's body, determined by markers, positioned according to the artist's will.

The visual representation is defined by selecting graphic parameters for each marker, or for each movement. These parameters are related to basic elements (such as circles or lines), their behavior (repeat, expand) and other characteristics (color, radius). The performer, then, links graphic parameters to curve parameters (color to scalar speed, for instance).

### STRUCTURE

As we can see in the structure diagram in the next page, the software can be initially divided in two parts.

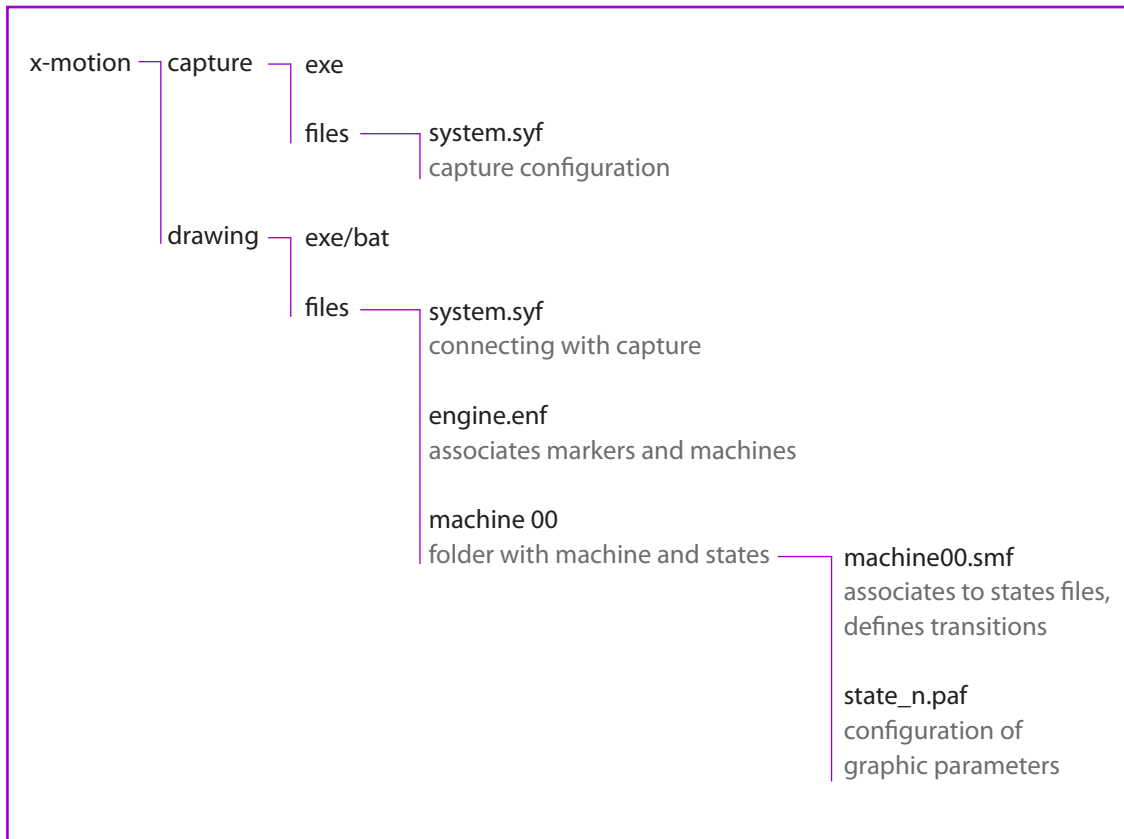
Each of both parts has an exe file. To run the system, it is necessary to run `XMotionCapture.exe` first. The two parts can be located in different computers, as long as they are correctly linked in the connection port (in the default example, port= 3050) and server (which is 'localhost' if both are in a same computer).

1. X-Motion Capture, which enables capture configuration editing ( `XMotion Capture> files > system.syf`), and runs the capture program ( `XMotionCapture.exe` ).

The editing content of `system.syf` is (the default example is set):

```
cameraWResolution= 620 (value in pixels)
cameraHResolution= 330 (value in pixels)
threshold= 70 (adjustable according to external factors, like light)
MarkerMinArea= 20 (area gets larger as the marker gets closer to the camera)
markerMaxArea= 500
numberOfMarkers= 1
port= 3050
```

2. X-Motion Drawing, which configures the graphics. The next part of this manual is dedicated to explain `XMotionDrawing.exe` and how to edit visual styles.



## X-MOTION DRAWING

There are two different ways to run X-Motion Drawing, after `XMotionCapture.exe` is already running. The file `XMotionDrawing.exe` determines a default configuration. The file `XMotionDrawingBlack.bat` can be edited, so window size (in pixels), full screen (0 for off, 1 for on) and background color (values for rgb) can be changed. After editing, a double-click in this file will run the program.

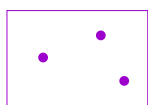
In the files folder, we will find:

1. `system.syf`, which indicates the relation with X-Motion capture. Here is an example:

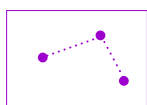
```
server= localhost
port= 3050
```

2. `engine.enf`, which specifies the number of markers, and their association with finite state machines (FSM):

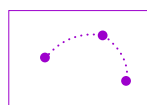
```
numberOf Markers= 1
Machine_for_marker= 0
..\files\machine00\machine00.smf
numberOf Vertex= 1000 (number of memorized points)
isInterpolating= 0 (interpolating option, 0: off, 1: on)
interpolatGrade= 0.1
softness= 0.5
```



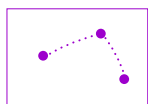
interpolation:



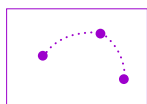
off



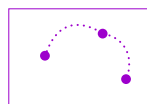
on



softness= 0



0.5



1.0

3. machine00 folder, which are the files to configure graphic parameters. The file machine00.smf, which contains the first configurations of the states, and the parameters file (.paf) will be explained in more details below.

## MACHINE00.SMF

This file contains the following information needed:

- numberOfStates
- state (name to be defined, like 'state01')
- numberOfFunctions, type and curveDrawType (fixed values for this version, respectively: 1, 1, 7)
- parametersFile (path for .paf file)
- currentState (initial state)
- numberOfTransitions

In this file, we also find the transitions configurations. Transitions are events between states, so we can move from one state to the next one. There are three options of transition:

type 0: scalar transition. Ex: scalar speed

type 1: vectorial transition. Ex: x and y position (it always needs these 2 values)

type 2: keyboard transition. Ex: press M to change

Each type will require a different set to be defined:

type 0:

transition (name to be defined, like '01\_02')

fromState

toState

type

parameterName (as specified in the table below)

conditionOperator (for x) (as specified in the table below)

conditionOperator (for y)

value (for x)

value (for y)

numberOfCallbacks (fixed value for this version = 0)

type 1:

transition

fromState

toState

type

parameterName

conditionOperator (scalar)

value (scalar)

numberOfCallbacks

type 2:

transition

fromState

toState

type

key (according to ASCII table. Ex: m=109)

numberOfCallbacks

## Parameters names

type	parameter type	parameter names
0	scalar	vertexScalarAcceleration vertexCurvature vertexScalarSpeed curveTime
1	vectorial	vertexPosition vertexDirection vertexSpeed vertexNormal vertexAcceleration
2	keyboard	key

## Conditional operators

type	parameter type	conditional operators
0	scalar	> < == (equal to) != (different of)
1	vectorial	> < == !=
2	keyboard	

## PARAMETER FILES (.PAF)

The .paf files define graphic parameters, both static and dynamic, besides linking them to curve parameters. Here, we will explain each possible configuration.

### 1. BOOLEANS AND

Booleans are parameters of only two possibilities: 0 or 1 (which means 'off' or 'on'). The term AND means that, among the 9 parameters, it is possible to select more than one option. The number of parameters appears in the beginning of each list of graphic parameters.

```
9
exagero_curva          0
balança_curva         0
ondula_curva          0
```

expande_curva	0
junta_curva	0
move_curva	0
cheio	0
repete_curve	0
gradual	0

## 2. BOOLEANS\_OR

Not implemented for this version.

## 3. BOOLEANS\_AND\_OR, brush

It defines which brush will be used. The OR means that only one option can be selected.

10		
linha	0	
linhagrosa	0	
linhagrosa_discontinua	0	
circulo	0	
circulo_azar	0	
ellipse	0	
poligono	0	
estrelha	0	
ameba	0	
tinta	0	

## 4. INTEGERS

It integrates some of the brushes above. It is composed of two modifiable values: initial and maximum value.

6			
poligon_sides	3	9	
estrelha_pontas	5	25	
ameba_logitude	10	50	
ameba_radio_centro	5	10	
ameba_radio_lados	2	10	

Obs: Such values between initial and maximum, or between minimum and maximum, will change dynamically if they are linked to curve parameters. This fact serves for all parameters in the same condition.

## 5. FLOATS

It also integrates some of the brushes, however it is composed of three values: initial, minimum and maximum.

33				
grado_exagero	.1	0	1	
altura_exagero	5	0	50	
grado_separa	2	2	6	
grado_junta	2	0	10	
frecuencia_balanço	.09	0	2	
amplitude_balanço	1.0007	1	2	

frecuencia_onda	.2	0	2
amplitude_onda	5	10	50
velocidade_move_x	0	-3	3
velocidade_move_y	1	1	2
radio_circulos	4	12	4
poligon_radio	15	5	15
poligono_velocidade_rotacao	0.001	0	5
estrelha_radio_1	3	2	10
estrelha_radio_2	10	3	25
estrelha_velocidade_rotacao	.1	0	10
coor_curva_r	255	0	255
coor_curva_g	239	0	255
coor_curva_b	57	0	255
coor_curva_a	255	0	255
coor_background_r	0	0	255
coor_background_g	0	0	255
coor_background_b	0	0	255
num_vertices	1000	0	10000
grosor_linhagrosa	2	0	20
repete_direction_x	0	-1	1
repete_direction_y	1	0	1
repete_distancia	1	0	50
repete_numero	21	2	30
radio_ellipse_x	15	5	10
radio_ellipse_y	40	10	40
radio_circulos_azar_min	2	10	20
radio_circulos_azar_max	8	20	40

## 6. LINKEDS

This parameter lists how many and which graphic parameters (such as color and radius) will be associated to curve parameters (such as position and speed). Ex:

```
2
radio_circulos
coor_curva_a
```

## 7. LINKEDS\_LIST

It complements the parameter above by adding, to each graphic, a curve parameter.

```
2
radio_circulos    vertex_position_y
coor_curva_a     vertex_scalar_speed
```

## 8. RANDOMS

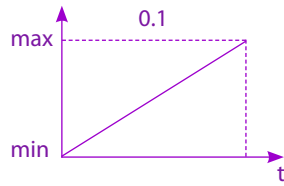
Parameters values will change randomly. Ex:

1  
coor\_curva\_g

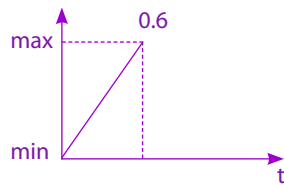
## 9. LINEALS

It changes the parameter in a linear form. Ex:

1  
coor\_curva\_a 0.1



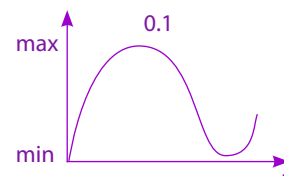
1  
coor\_curva\_a 0.6



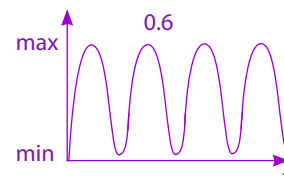
## 10. OSCILERS

It changes the frequency between min. and max. values. Ex:

1  
estrella\_pontas 0.1



1  
estrella\_pontas 0.6



## APPENDIX

Curve parameter names to be linked to graphic parameters, in .paf files:

- vertex\_position\_x
- vertex\_position\_y
- vertex\_direction\_x
- vertex\_direction\_y
- vertex\_speed\_x
- vertex\_speed\_y
- vertex\_normal\_x
- vertex\_acceleration\_x
- vertex\_acceleration\_y
- vertex\_scalar\_speed
- vertex\_scalar\_acceleration
- vertex\_curvature
- curve\_time